CLAIMS

1. A method of controlling connection of a supply of AC power to a load and to a power supply grid, the supply of AC power being generated by an AC power generating system of the kind that comprises a source of power arranged to provide an electrical output, converter means for generating an AC power output to supply the load from the electrical output, and control means which are operable to control the operation of the converter means and thereby to supply the power required to the load both when the AC power output of the AC power generating system is connected to the power supply grid as well as to the load and during independent operation of the AC power generating system to supply the load including in the event of disconnection of the AC power output from the power supply grid, the control means being operable in response to signals derived from sensed current and/or voltage of an electrical output which is generated by the converter means from the electrical output of the source of power, wherein the current and voltage of the AC power output and the voltage of the power supply grid are monitored, characterised in that one reference which is derived from the monitored AC power output voltage and which is used as a reference in the operation of the converter means to control the generation of the AC power output during independent operation of the AC power generating system to supply the load is replaced by another reference which is derived from the monitored grid voltage when the AC power output is to be connected to the power supply grid such that generation of the

AC power output by the converter means of the AC power generating system is controlled in accordance with the other reference that is derived from the monitored grid voltage when the AC power output of the AC power generating system is connected to the power supply grid as well as supplying the power required by the load.

2. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 1, wherein, in the event of disconnection of the AC power output from the power supply grid or of loss of the grid voltage, said other reference is replaced by said one reference with which it is substantially overlapping in phase and amplitude so that said AC power generating system operates independently and continues substantially without interruption to supply the power required by the load.

3. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 1 or claim 2, wherein the source of power is controllable and provides a variable voltage and/or current electrical output, the AC power output generated by the converter means for supply to the load being substantially independent of variations in the electrical output of the controllable source and said control means being operable to control the operation of said controllable source as well as the operation of said converter means.

4. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 3, including controlling the operation of said controllable source by said control means in response to the monitored current and voltage of the AC power output when the AC power output is connected to the power supply grid so that active and reactive power that are transmitted to the power supply grid are adjusted and controlled in accordance with the voltage of the grid.

5. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 1 to 4, wherein the AC power output current for the or each phase is monitored between the inductor and the capacitor of an LC filter for that phase.

6. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 1 to 5, including comparing one output signal produced by voltage reference generator means with the monitored AC power output voltage in a voltage controller which responds by producing said one reference.

7. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 6 when appended to claim 4, including the step of deriving a voltage reference signal from the monitored grid

voltage, feeding that voltage reference signal to said voltage reference generator means, operating said voltage reference generator means to modify said one output signal so as to change its phase and amplitude progressively towards those of said voltage reference signal, and delaying connection of said AC power output to the grid until after said one reference and said voltage reference signal are substantially overlapping in phase and amplitude.

8. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 7, wherein said voltage reference signal is derived from said monitored grid voltage by feeding said monitored grid voltage to an input of a phase lock loop, said voltage reference signal being the output of said phase lock loop.

9. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 7 or claim 8, including feeding said voltage reference signal to said voltage controller instead of said one output signal, operating said voltage controller to compare said voltage reference signal with said monitored AC output voltage to produce said one reference once said one reference signal and said voltage reference signal are substantially overlapping in phase and amplitude.

10. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 9, wherein said one reference is

replaced by said other reference after said one output signal has been replaced by said voltage reference signal.

11. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 1 to10, including deriving said other reference from said voltage reference signal.

12. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 11, wherein said other reference is also derived from an active power reference and a reactive power reference.

13. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 1 to 12, wherein said other reference is also derived from said monitored AC power output active current.

14. A method of controlling connection of a supply of AC power to a load and to a power supply grid according to claim 10 or any one of claims 11 to 13 when appended to claim 10, including reconnecting said one output signal to said voltage controller and replacing said other reference by said one reference in the event of disconnection of the AC power output from the power supply grid or loss of the grid voltage.

15. A system for controlling connection of a supply of AC power to a load

and to a power supply grid, the supply of AC power being generated by an AC power generating system of the kind that comprises a source of power arranged to provide an electrical output, converter means for generating an AC power output to supply the load from the electrical output, and control means which are operable to control the operation of the converter means and thereby to supply the power required to the load both when the AC power output of the AC power generating system is connected to the power supply grid as well as to the load and during independent operation of the AC power generating system to supply the load including in the event of disconnection of the AC power output from the power supply grid, the control means being operable in response to signals derived from sensed current and/or voltage of an electrical output which is generated by the converter means from the electrical output of the source of power, the system comprising means operable to monitor the current and voltage of the AC power output and the voltage of the power supply grid, characterized by means for deriving one reference from the monitored AC power output voltage, said one reference being for use as a reference in the operation of the converter means to control the generation of that AC power output during independent operation of the AC power generating system to supply the load, and means for deriving another reference from the monitored grid voltage, said control means being operable to replace said one reference by the other reference which is derived from the monitored grid voltage when the AC power output is connected to the power supply grid such that generation of the AC power output by the converter means of the AC power generating system is controlled in accordance with the other reference that is derived from the monitored grid voltage

when the AC power output of the AC power generating system is connected to the power supply grid as well as supplying the power required by the load.

16. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 15, wherein said control means are operable to replace said other reference by said one reference with which said other reference is overlapping in phase and amplitude so that said AC power generating system operates independently and continues substantially without interruption to supply the power required by the load.

17. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 15 or claim 16, wherein the source of power is controllable and provides a variable voltage and/or current electrical output, the AC power output generated by the converter means for supply to the load being substantially independent of variations in the electrical output of the controllable source and said control means being operable to control the operation of said controllable source as well as the operation of said converter means.

18. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 17, wherein said control means that are operable to control the operation of the controllable source are responsive to the monitored current and voltage of the AC power output when the AC power output is connected to the power supply grid so that active and reactive power that are

transmitted to the power supply grid are adjusted and controlled in accordance with the voltage of the grid.

19. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims15 to 18, wherein the AC power output current for the or each phase of the AC power output is monitored between the inductor and capacitor of an LC filter for that phase.

20. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 13 to 17, including voltage reference generator means which are operable to produce one output signal and a voltage controller which is operable to compare the monitored AC power output voltage with said one output signal and thereby to produce said one reference.

21. A system for controlling connection of a supply of AC power to load and to a power supply grid according to claim 20 when appended to claim 18, wherein a voltage reference signal which is derived from the monitored grid voltage is fed to said voltage reference generator means, said voltage reference generator means being operable to modify said one output signal so as to change its phase and amplitude progressively towards those of said voltage reference signal, connection of said AC power output to the grid being delayed until after said one reference and said voltage reference signal are substantially overlapping in phase and amplitude.

22. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 21, including a phase lock loop having an input and an output, wherein said monitored grid voltage is fed to the input of the phase lock loop and said voltage reference signal is emitted from the output of said phase lock loop.

23. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 21 or claim 22, including first transfer switch means which are operable once said one reference signal and said voltage reference signal are substantially overlapping in phase and amplitude, so that said voltage reference signal is fed to said voltage controller instead of said one output signal for comparison with said monitored AC output voltage to produce said one reference.

24. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 23, including second transfer switch means which are operable once said one output signal has been replaced by said voltage reference signal, so that said one reference is replaced by said other reference.

25. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 15 to 24, wherein said

other reference is derived from said voltage reference signal.

26. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 25, wherein said other reference is also derived from an active power reference and a reactive power reference.

27. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to any one of claims 15 to 26, wherein said other reference is also derived from said monitored AC power output active current.

28. A system for controlling connection of a supply of AC power to a load and to a power supply grid according to claim 24 or any one of claims 25 to 27 when appended to claim 24, wherein, the first and second transfer means are operable to reconnect said one output signal to said voltage controller and to replace said other reference by said one reference so that said power supply apparatus operates independently in the event of disconnection of the AC power output of the AC power generating system from the power supply grid or of loss of grid voltage.